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Building A Local Design And Entrepreneurship Ecosystem

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Abstract

Design and creativity are becoming greatly sought out skills in leading industries around the world, big businesses are developing the "Chief Design Officer" to engage with strategic and company shaping discussions. Design as an economic driver is now abundantly clear with companies such as Nike and Apple leading this way of thinking, but how do we as Australian industry capture this and how do we instil "creativity" into our secondary school and university level education to drive the next level of innovation and development.

The local region where Deakin University is situated has undergone significant changes in the last 10 years, what was once an economy dominated by oil, automotive and metal production industries has been wound down to a local economy dominated by health, services and education. However, manufacturing and design being the front end of manufacturing is still a key economic driver this study is looking at the embryonic initiatives undertaken to build an ecosystem of design and entrepreneurship in a regional area.

Several aspects will be looked at, high school and university student engagement in the process, established SME's and start-up culture. With the establishment of an ecosystem it is believed that success will breed success. With student engagement showing that being creative and playing can yield tangible results, it also gets students comfortable with the element of risk. The efforts of Deakin University is about providing the framework and scaffolding for students to pursue a start-up idea and test it validity. The final part of the ecosystem is for SME's and recent start-ups to share their success stories and acting as mentors as future start-ups emerge. By creating an ecosystem that is driven by design, manufacturing and entrepreneurship key economic outcomes will be generated; a regional area will be more resilient to economic uncertainty and ultimately a cohort of innovative thinkers that will generate value for their community.

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1. Introduction

For any ecosystem to develop there needs to be several key factors. In this particular ecosystem there is a need to develop new and innovative design and manufacturing firms to replace the departure of what was once a strong traditional manufacturing sector. We have three tiers within the ecosystem and a scaffolded framework being provided by Deakin University. The three tiers can be divided into middle / high schools, university undergraduate students and SME / start-ups and commercialisation.

Several programmes have been developed and executed with middle and high school students by Deakin University. This school based programme mainly revolved around the design thinking methodology, creating new product for themselves using additive manufacturing and developing CAD skills. The key outcome for middle / high school students was around the development of product and new skill acquisition. The second tier of the ecosystem is undergraduate university students, these students have access to some of the latest knowledge, tools and techniques, but they also have the ability to develop solution without too many constraints given the appropriate framework. The third tier of the ecosystem is the entrepreneurs of the past, people who have gone before developed businesses and now while successful can act as mentors and guides for the next generation of innovators. The second half of the third tier in the ecosystem is the framework or environment; in this case it is the university that provides the infrastructure and academic input.

There are other places in the world where such an ecosystem exists in formal and informal states. For example Palo Alto in California has access to such an ecosystem through d.School at Stanford University (d.School, 2015). The d.School interacts with junior, middle and high schools with great emphasis on design thinking. At the university level d.School has elective classes for both undergraduate and post graduate programmes to not only develop design thinking skills but through specific subjects students are able to launch their own business (Launchpad d.School, 2015). The next stage is the incubator process that the Palo Alto area runs by an organisation external to the university; such examples are Y Combinator, which provides that next level mentorship and support in design and entrepreneurship (Y Combinator, 2015).

2. Middle and High School Education

There is much literature on when students lose interest in Science, Technology, Engineering and Maths (STEM), it seems to be commonly accepted that this interest wanes in middle school (years 6-8 in Australia) (Wyss, 2012). This age bracket from 10-14 year old students typically lose focus and enjoyment of STEM subject for a variety of reasons, most common causes are peer, social and parental influence and the effect of manufacturing sector (Fredricks, 2004). The programme of study was developed to re-engage students in the area of STEM using the visualise-analyse-realise methodology and 3D printing in a school setting whilst meeting several of the students learning goals as specified by AusVELs (ACARA, 2014).

Visualise – Students were asked to design a product; any product they wanted as it was a completely self-directed design, the teachers and mentoring staff were there to guide the student through the tasks. The first stage was solving a need or designing a product they wanted via noting ideas and sketches on paper, literally going back to first principles. This stage was difficult as the students had trouble coming up with their own ideas and being creative in such a free environment: a couple of techniques were employed such as the B.A.R method where we asked students to make something Bigger, Add extra features or components or Replace something. We also got them to use their own interests as motivation e.g. sports or gaming seemed to be very popular. The ideation stage last for two, 45 minute sessions in which all students developed their concept and competed a couple of different profile views, so they could get an understanding of the products three dimensions.

Analyse – for the students this meant putting their initial design into a 3D model via computer aided design software. As with the majority of schools in Victoria many students have access to computers, laptops or tablets, in this task a decision was made to use TinkerCAD (TinkerCAD, 2014) from the Autodesk software suite of products.

This was done for several reasons, the learning curve for the software is very quick, and the majority of students were able to develop a 3D concept within the first 45 minute session with a subsequent two further 45 minute sessions to refine their concepts. The software is a free download and works on multiple platforms or can be used from a web browser it also exports straight to .stl format which is needed for 3D printing. The biggest point of TinkerCAD is that all the designs start with primitive shapes, eg, cubes, spheres and pyramids which literally can be dragged, dropped and stretched as required in a very friendly graphical user interface. Further to the software / hardware environment, technical expertise was needed as 3D modelling and printing skills are not readily found in every middle school programme, in this case School of Engineering at Deakin University loaned a Makerbot Replicator 2 to the school and several sessions of university staff time. The resources, motivation and time created the environment for the students to develop the product of their choosing. Anecdotally the students that picked up 3D modelling the quickest were generally the students that are "gamers" and have a very good grasp of interacting in a 3D screen environment, but all students were able to produce a concept within the time period allotted.

Realise –students physically got to see their products being printed and produced into something tangible. The students also developed links between other classes and 3D CAD; for example Boolean algebra skills through addition and subtraction of shapes, communication skills, explaining and translating a sketch from paper to 3D screen environment; and finally to physical product. Whilst many products were toys or game based (for example one student designed a geometric inspired chess set) the skills they learnt satisfied the teaching staff need for AusVELs thresholds and the students gained an experience that is quite easy to replicate given a few key resources.

3. Undergraduate Education

A two pronged approached to undergraduate education is being implemented. Firstly an opt-in experiential programme called "Spark" (Spark, 2015) has been developed; the second is a dedicated unit of study on "Entrepreneurship" (SEB201, 2015) in which students can receive course credit. Both programmes follow the same format of being open to any interested student, there is an element of self-selection. Due to the nature of the students and Deakin University students in the first intake of the Spark programme are mainly around engineering and hardware solutions. This is a function of the engineering and materials research areas that Deakin University has. This is mimicking a trend that is happening at other entrepreneurial programmes around the world where there is now more focus on hardware solutions.

There are three main goals of the Spark programme:

1. Mentor supported team projects with a hand-on focus
2. Themed workshops to broaden awareness and gain new skills
3. Guest speakers to inspire students and demystify entrepreneurship

This is being achieved in two ways, first a series of workshops by mentors and entrepreneurs who have experienced the journey and also a two-day workshop run by specialists in the area.

The entrepreneurship subject has similar aim but structured in a more formalised format with credit point achievement as the primary outcome towards course completion.

The description of the unit is:

"Students will explore the concepts of entrepreneurship and intrapreneurship as commonly encountered in enterprise-based commercial innovation initiatives. Concepts such as branding, marketing, disruptive innovation and intellectual property will be explored and how those concepts are applied to product and service development. Students will be encouraged to engage in a variety of exercises that allow for generation of ideas, testing of concepts and evaluating effectiveness. The unit will allow students to enhance and apply their knowledge from various disciplines towards the creation of positive social and/or environmental change."

The unit outcomes are as follows:

1. Develop and practice specialised skills and knowledge associated with entrepreneurship, reflecting on real life experiences.
2. Demonstrate an ability to apply skills and knowledge in effective enterprise-based innovation and an ability to identify and cope with uncertainties and challenges associated with it.
3. Demonstrate ability and apply communication skills in enterprise-based innovation initiatives.
4. Demonstrate ability to plan and manage entrepreneurial-based / enterprise based innovation initiatives

Whilst it is not the aim for each student who participates in the programmes to achieve or start a successful company it is about perspective and awareness. The outcomes are more around the experience to acknowledge the environment that the students may find. This is an important aspect of the eco-system to allow students to become a cohort of professionals that can adapt to and work in the start-up and innovation cultures (Berry et al, 2014).

4. SME / Start-up Mentorship and Commercialisation

This stage is the smallest cohort in the ecosystem as well as the last stage. The mentorship aspect of the eco-system consists of four main members:

1. SME / Start-up founders

The role of the SME / Start-up founder is aspirational and motivational for the eco-system; their main role is to demystify entrepreneurship and lend experiences, stories and guidance to the cohort of students in both the Spark programme and entrepreneurship subject.

2. Intellectual property / legal firms

For any knowledge based company intellectual property is an important competitive advantage. Protecting the knowledge to maintain and exploit a competitive advantage is a dedicated industry within itself. For the eco-system the students need to understand this necessity of business. Students who choose to go down this route will need to understand the differences between patents, design registrations and trade secrets to mention a few strategies. Having a firm or group of firms working with students will increase this awareness and in the medium to long term will be a good return on investment for the firms.

3. University Research Commercial Operations

Most universities have dedicated commercial operation groups to support student based initiatives and do receive a significant return on investment (Stanford, MIT, Twente University). University commercial groups have the knowledge on the legal, company structures, IP protection and market research and applications. They also look across the university research and teaching areas and will have a good handle on key research areas. Another function is collaborative partners to assist in the development both external and internal to the university; start-ups working with collaborative partners can be a similar relationship to a mentor/mentee but from a business to business perspective, it can also serve as the start point for cash flow.

4. University Academics

This group is one of the most important groups in the eco-system as they have the ability to potentially identify and nurture the student cohort to feed into the ecosystem. They are also discipline experts that can also feed into the initial idea, ongoing development and applications derived from the students. Having academics as a key group also helps research translate into products through student based developments. The academics also have access to lab and project space and technical staff to allow students to explore these ideas further with specialist equipment and knowledge.

5. Discussion

Building the local eco-system requires multiple levels of committed development across several areas of the community and a regionally based university provides the scaffolding to achieve such as system. This is a developing environment that relies on several key events to occur. The first key event is engagement of middle and high school students to realise and embrace careers in design and technology are valid vocational paths. The second event in the eco-system is that these school students' transfers into university level education and participate in experiential programmes such as Spark and entrepreneurship based units of study. The final event is that these students have an idea and passion that they are significantly devoted to and passionate about to pursue the entrepreneurial path. The framework of the SME/Start-up mentors and commercialisation need to be active throughout the process as the student transition through the stages. If one part of the eco-system is not active then it is much harder for it to develop and grow further.

6. Conclusion

If past eco-systems that have been developed are an example to be followed the development of a regional eco-system here is a medium to long-term project that could conceivable take up to 10 years to fully establish. The eco-system present is now only 18 months old and it started with middle to high school engagement, the undergraduate engagement has only started in early 2015. The key indicators that all the parts of the eco-system exist in the regional area, it is just a matter of time, development, studies a few good ideas. Once the eco-system starts to produce these new students and eventual companies then the void of traditional manufacturing that dominated the 1900's will be replaced by new innovative manufacturing.

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